IBM Flash Adapters Enterprise Value for System x

IBM Redbooks Product Guide

The IBM® Flash Adapters F825, F1650, and F3200 Enterprise Value for System x® are designed for the application of solid-state storage to webscale and cloud data centers. Delivering high speed, low latency, and high efficiency, this new line of flash adapters brings scalable and optimized performance to distributed scale-out architectures at low cost. These adapters are designed primarily for cost-efficient high volume servers and computing appliances to maximize compute efficiency while providing the added benefits of lower power and cooling costs, low management impact, and smaller storage footprints.

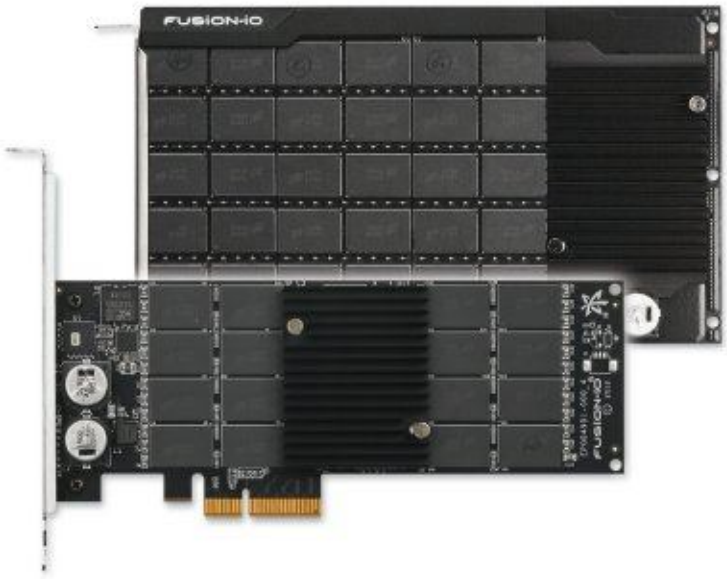

Figure 1. IBM Flash Adapters Enterprise Value for System x

Did you know

The IBM Flash Adapters Enterprise Value use flash memory as their storage medium, contain no moving parts, and do not have the issues associated with vibration, noise, and mechanical failure. The adapters are built as block devices on a PCIe bus with advanced wear-leveling, advanced ECC, and chip-level redundancy, providing exceptional reliability and efficiency.

These adapters can provide lower operational expenditure (OPEX) and capital expenditure (CAPEX) in applications that require high storage I/O performance compared to solutions that use a larger number of hard disk drives and solid-state drives to achieve equivalent performance.

Rigorous testing of the IBM Flash Adapters Enterprise Value by IBM through the IBM ServerProven® program ensures a high degree of confidence in storage subsystem compatibility and reliability. Providing an additional peace of mind, the adapters are covered under IBM warranty.

Part number information

Table 1 lists the information for ordering part numbers and feature codes.

Table 1. Ordering part numbers and feature codes

Description	Part number	Feature code
IBM Flash Adapter F825 Enterprise Value for System x	00AE861	A4WT
IBM Flash Adapter F1650 Enterprise Value for System x	00AE864	A4WS
IBM Flash Adapter F3200 Enterprise Value for System x	00AE867	A4WR

The part numbers for the adapters include the following items:

- IBM Flash Adapter Enterprise Value with 3U bracket attached
- 2U bracket (F825 and F1650 adapter only)
- USB Key with documentation
- Quick Install Guide
- *Important Notices* document
- Warranty Flyer

Features

Based on the standard PCIe architecture coupled with silicon-based NAND clustering storage technology, the Flash Adapters Enterprise Value are optimized for System x rack servers. These scalable designs include cost-effective Multi-Level Cell (MLC) technology in standard PCIe form factors.

These adapters use NAND flash memory as the basic building block of solid-state storage and contain no moving parts, so they are less sensitive to issues associated with vibration, noise, and mechanical failure. These adapters are built as block devices on a PCIe bus with advanced wear-leveling, ECC, and chip-level redundancy providing unparalleled reliability and efficiency.

The IBM Flash Adapters Enterprise Value for System x can deliver fast and scalable performance at low latency required for webscale and cloud environments. The following typical applications require ultra-high I/O performance:

- Large scale transaction processing
- Cloud computing
- Content distribution
- On-demand streaming
- Data warehousing
- Business intelligence and analytics
- Decision support

The IBM Flash Adapters Enterprise Value have many features.

Technology features

- Up to 3.2 TB of solid-state storage in an industry-standard PCIe form factor.
- High-density design with cost-effective MLC NAND technology reduces storage footprint.
- Functions as a PCIe storage and controller device. The operating system sees a block device.

Performance features

- High-speed, low latency, consistent, and scalable I/O performance
- Access latency can be as low as 19 µs
- Up to 1.5 GBps of sustained sequential throughput
- Up to 144,000 random read IOPS and up to 535,000 random write IOPS using 512 bytes data blocks
- Integrates with host processor as a memory tier for direct parallel access to flash

Reliability features

- Advanced wear leveling
- ECC protection
- Adaptive Flashback redundancy for RAID-like chip protection with self-healing capabilities

Monitoring and management features

- Power consumption
- Thermal information
- Flash wear-out

Note: These adapters cannot be used as bootable devices.

Technical specifications

Table 2 presents the technical specifications for the IBM Flash Adapters Enterprise Value.

Table 2. IBM High IOPS MLC Adapter technical specifications

Specification	825 GB	1650 GB	3200 GB
Part number	00AE861	00AE864	00AE867
Interface	PCIe 2.0 x4	PCIe 2.0 x4	PCIe 2.0 x8 (x4-wired)
Form factor	Half height, half length	Half height, half length	Full height, half length
Capacity	825 GB	1650 GB	3200 GB
Endurance	4 PB TBW	8 PB TBW	20 PB TBW
Random read IOPS (512 bytes blocks)	135,000	144,000	115,000
Random write IOPS (512 bytes blocks)	535,000	535,000	535,000
Random read IOPS (4 KB blocks)	130,000	130,000	115,000
Random write IOPS (4 KB blocks)	235,000	235,000	243,000
Sequential read rate (1 MB blocks)	1.4 GBps	1.4 GBps	1.5 GBps
Sequential write rate (1 MB blocks)	1.1 GBps	1.1 GBps	1.3 GBps
Read access latency	77 µs	77 µs	92 µs
Write access latency	19 µs	19 µs	19 µs
Power requirements	25 W max	25 W max	25 W max

The TBW (total bytes written) value assigned to a solid-state device is the total bytes of written data (based on the number of P/E cycles) that a device can be guaranteed to complete (the percentage of remaining P/E cycles is equal to the percentage of remaining TBW). The IBM warranty for the solid-state storage is limited to devices that have not reached the maximum guaranteed number of program/erase cycles. Solid-state storage that reaches this limit might fail to operate according to its specifications. Because of such behavior by solid-state devices, careful planning must be done to use solid-state storage in the application environments to ensure that the TBW of the device is not exceeded before the end of the required life expectancy.

Writes are tracked and reported by the adapter's management utility and might be affected by application writes, data patterns, and maintenance designed to maximize data integrity.

Supported servers

Table 3 lists the compatibility information for the IBM Flash Adapters Enterprise Value and System x and IBM iDataPlex® servers.

Table 3. System x, iDataPlex, and NeXtScale compatibility (Part 1)

Part number	Description	x3250 M5 (5458)	x3500 M4 (7383, E5-2600 v2)	x3530 M4 (7160, E5-2400 v2)	x3550 M4 (7914, E5-2600 v2)	x3630 M4 (7158, E5-2400 v2)	x3650 M4 (7915, E5-2600 v2)	x3650 M4 BD (5466)	x3650 M4 HD (5460)	x3750 M4 (8752)	x3850 X6/x3950 X6 (3837)	dx360 M4 (7912, E5-2600 v2)	nx360 M4 (5455)
00AE861	IBM Flash Adapter F825 Enterprise Value	N	N	N	Y	Y	Y	N	N	N	N	N	N
00AE864	IBM Flash Adapter F1650 Enterprise Value	N	N	N	Y	Y	Y	N	N	N	N	N	N
00AE867	IBM Flash Adapter F3200 Enterprise Value	N	N	N	Y	Y	Y	N	N	N	N	N	N

Table 3. System x, iDataPlex, and NeXtScale compatibility (Part 2)

Part number	Description	x3100 M4 (2582)	x3250 M4 (2583)	x3300 M4 (7382)	x3500 M4 (7383, E5-2600)	x3530 M4 (7160, E5-2400)	x3550 M4 (7914, E5-2600)	x3630 M4 (7158, E5-2400)	x3650 M4 (7915, E5-2600)	x3690 X5 (7147)	x3750 M4 (8722)	x3850 X5/x3950 X5 (7143)	dx360 M4 (7912, E5-2600)
00AE861	IBM Flash Adapter F825 Enterprise Value	N	N	N	N	N	Y	Y	Y	N	N	N	N
00AE864	IBM Flash Adapter F1650 Enterprise Value	N	N	N	N	N	Y	Y	Y	N	N	N	N
00AE867	IBM Flash Adapter F3200 Enterprise Value	N	N	N	N	N	Y	Y	Y	N	N	N	N

See the IBM ServerProven website for the latest compatibility information for System x servers at http://ibm.com/servers/eserver/serverproven/compat/us/.

Supported operating systems

The IBM Flash Adapters Enterprise Value support the following operating systems:

- Microsoft Windows Server 2008, Enterprise x64 Edition
- Microsoft Windows Server 2008, Standard x64 Edition
- Microsoft Windows Server 2008 R2
- Microsoft Windows Server 2012
- Microsoft Windows Server 2012 R2
- Red Hat Enterprise Linux 5 Server x64 Edition
- Red Hat Enterprise Linux 5 Server with Xen x64 Edition
- Red Hat Enterprise Linux 6 Server x64 Edition
- SUSE Linux Enterprise Server 11 for AMD64/EM64T
- SUSE Linux Enterprise Server 11 with Xen for AMD64/EM64T
- VMware vSphere 5.1 (ESXi)
- VMware vSphere 5.5 (ESXi)

See the IBM ServerProven website for the latest information about the specific versions and service packs supported at http://ibm.com/servers/eserver/serverproven/compat/us/. Click **System x servers**, then **Storage Controllers and SSD adapters** to see the support matrix. Click the check mark that is associated with the System x server in question to see the details of the operating system support.

Warranty

The IBM Flash Adapters Enterprise Value carry a 1-year, customer-replaceable unit (CRU) limited warranty. When installed in a supported IBM server, these adapters assume your system's base warranty and any IBM ServicePac® upgrade.

Physical specifications

The IBM Flash Adapters F825 and F1650 Enterprise Value have the following physical specifications:

Dimensions and weight (approximate):

- Height: 16 mm (0.6 in.)
- Width: 68 mm (2.7 in.)
- Depth: 167 mm (6.6 in.)
- Weight: 180 g (0.4 lb)

Shipping dimensions and weight (approximate):

- Height: 65 mm (2.6 in.)
- Width: 225 mm (8.9 in.)
- Depth: 245 mm (9.6 in.)
- Weight: 413 g (0.9 lb)

The IBM Flash Adapter F3200 Enterprise Value has the following physical specifications:

Dimensions and weight (approximate):

- Height: 16 mm (0.6 in.)
- Width: 110 mm (4.3 in.)
- Depth: 167 mm (6.6 in.)
- Weight: 310 g (0.7 lb)

Shipping dimensions and weight (approximate):

- Height: 65 mm (2.6 in.)
- Width: 225 mm (8.9 in.)
- Depth: 245 mm (9.6 in.)
- Weight: 540 g (1.3 lb)

Operating environment

The IBM Flash Adapters Enterprise Value are supported in the following environment:

- Temperature (operational): 0 - 55 °C (32 - 131 °F) at 0 - 3,048 m (0 - 10,000 ft)
- Relative humidity: 5 - 95% (non-condensing)
- Maximum altitude (operational): 3,048 m (10,000 ft)

Agency approvals

The IBM Flash Adapters Enterprise Value conform to the following regulations:

- EN55022
- EN55024
- EN60950 / CE
- EN 61000-3-2
- EN 61000-3-3
- IEC 950 CB Scheme
- FCC Part 15 Class A, and Class B
- UL 1950
- CSA C22.2 950-95
- VCCI
- NZ AS3548 / C-tick
- RRL for MIC (KCC)
- BSMI
- UL 94-/V

Related publications and links

For more information, see the following documents:

- IBM US Announcement Letter
  http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS113-177
- IBM High IOPS SS Class SSD PCIe Adapter Documentation - IBM System x
  http://ibm.com/support/entry/portal/docdisplay?lndocid=MIGR-5091557
- IBM High IOPS System x server configuration information and requirements
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- IBM System x Configuration and Options Guide
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